

CLAIMS

1. An interleaving device comprising:

a first interleaving means for performing folding interleaving on first data comprised of plural input packets, in units of a data word
5 or plural consecutive data words; and

a second interleaving means for performing interleaving on second data comprised of plural packets generated by said first interleaving means, in units of the packet.

10 2. The interleaving device according to claim 1, wherein said second interleaving means replaces a value of beginning data in a first packet of packet-unit interleave.

3. The interleaving device according to claim 2, wherein said
15 beginning data is a sink byte in a header of a packet that constitutes said first data.

4. The interleaving device according to claim 1,
wherein said first interleaving means is installed by using first
20 storage means incorporated in a programmable device; and

wherein said second interleaving means is installed by using second storage means externally attached to said programmable device.

5. The interleaving device according to claim 4, wherein said
25 first storage means is a dual-port random access memory in which inconsecutive addresses are accessed in units of a data word at each clock synchronized with the data word.

6. The interleaving device according to claim 4, wherein said second storage means is a random access memory fitted to burst transfer of data in units of plural data words.

5 7. The interleaving device according to claim 6, wherein said second storage means is a synchronous dynamic random access memory.

8. The interleaving device according to claim 1, wherein an error correction code is added to each of the packets that constitute said first
10 data.

9. The interleaving device according to claim 8, wherein each of the packets that constitute said first data is obtained by adding said error correction code to plural transport packets, respectively, that
15 constitute a transport stream obtained by performing compression and encoding on the basis of the MPEG-2 standard on predetermined data.

10. The interleaving device according to claim 8, wherein said error correction code is a Reed-Solomon code.
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11. The interleaving device according to claim 1, wherein said first interleaving means performs folding interleaving on said first data in units of a byte or plural consecutive bytes.

25 12. An interleaving method comprising:
a first interleaving step of performing folding interleaving on first data comprised of plural input packets, in units of a data word or plural consecutive data words; and

a second interleaving step of performing interleaving, in units of a packet, on second data comprised of plural packets generated by the first interleaving step.

5 13. The interleaving method according to claim 12, wherein in said second interleaving step, a value of beginning data in a first packet of packet-unit interleave is replaced.

10 14. The interleaving method according to claim 13, wherein said beginning data is a sink byte in a header of a packet that constitutes said first data.

15 15. The interleaving method according to claim 12, wherein said first interleaving step is performed by using first storage means which is incorporated in a programmable device; and wherein said second interleaving step is performed by using second storage means which is externally attached to the programmable device.

20 16. The interleaving method according to claim 15, wherein as said first storage means, a dual-port random access memory in which inconsecutive addresses are accessed in units of a data word at each clock synchronized with the data word is used.

25 17. The interleaving method according to claim 15, wherein as said second storage means, a random access memory fitted to burst transfer of data in units of plural data words is used.

18. The interleaving method according to claim 17, wherein as said second storage means, a synchronous dynamic random access memory is used.

5 19. The interleaving method according to claim 12, wherein an error correction code is added to each of the packets that constitute said first data.

20. The interleaving method according to claim 19, wherein each
10 of the packets that constitute said first data is obtained by adding said error correction code to each of plural transport packets that constitute a transport stream obtained by performing compression and encoding on the basis of the MPEG-2 standard on predetermined data.

15 21. The interleaving method according to claim 19, wherein said error correction code is a Reed-Solomon code.

22. The interleaving method according to claim 12, wherein in said first interleaving step, folding interleaving is performed on said
20 first data in units of a byte or plural consecutive bytes.

23. A de-interleaving device comprising:

a first de-interleaving means for performing de-interleaving, in units of a packet, on third data comprised of plural input packets, in
25 such a manner as to restore an order of packets of data generated by performing first interleaving, which is folding interleaving, on first data comprised of plural input packets in units of a data word or plural consecutive data words and performing second interleaving in units of a

packet on second data comprised of plural packets generated by said first interleaving to an order of the packets that constitute the second data; and

second de-interleaving means for performing folding de-interleaving, in units of a data word or plural consecutive data words, on fourth data comprised of plural packets generated by said first de-interleaving means, in such a manner as to restore an order of the packets that constitute said second data to an order of the packets that constitute said first data.

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24. The de-interleaving device according to claim 23, wherein a value of beginning data in a first packet in packet-unit interleave is replaced according to said second interleaving; and

wherein said first de-interleaving means synchronizes a first packet in said third data on the basis of the beginning data whose value is replaced according to said second interleaving.

25. The de-interleaving device according to claim 24, wherein said beginning data is a sink byte in a header of a packet that constitutes said first data.

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26. The de-interleaving device according to claim 24, wherein said first de-interleaving means restores a replaced value of said beginning data to an original value, to generate said fourth data.

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27. The de-interleaving device according to claim 23, wherein said first de-interleaving means knows whether a packet is lost on the

basis of information indicating consecutiveness of packets that constitute said third data.

28. The de-interleaving device according to claim 27, wherein
5 said first de-interleaving means, when having known that a packet is lost, replaces data that corresponds to the lost packet with invalid data, to generate said fourth data.

29. The de-interleaving device according to claim 23,
10 wherein said first de-interleaving means is installed by using first storage means which is externally attached to a programmable device; and

wherein said second de-interleaving means is installed by using second storage means which is incorporated in the programmable device.
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30. The de-interleaving device according to claim 29, wherein said first storage means is a random access memory that is fitted to burst transfer of data in units of plural data words.

20 31. The de-interleaving device according to claim 30, wherein said first storage means is a synchronous dynamic random access memory.

32. The de-interleaving device according to claim 29, wherein said second storage means is a dual-port random access memory in which
25 inconsecutive addresses are accessed in units of a data word at each clock synchronized with the data word.

33. The de-interleaving device according to claim 23, wherein a predetermined error correction code is added to each of the packets that constitute said first data.

5 34. The de-interleaving device according to claim 33, wherein each of the packets that constitute said first data is obtained by adding said error correction code to plural transport packets, respectively, that constitute a transport stream obtained by performing compression and encoding on the basis of the MPEG-2 standard on predetermined data.

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35. The de-interleaving device according to claim 33, wherein said error correction code is a Reed-Solomon code.

36. The de-interleaving device according to claim 23,
15 wherein said first interleaving is folding de-interleaving which is performed in units of a byte or plural consecutive bytes; and
 wherein said second de-interleaving is folding de-interleaving which is performed in units of a byte or plural consecutive bytes.

20 37. A de-interleaving method comprising:
 a first de-interleaving step of performing de-interleaving, in units of a packet, on third data comprised of plural input packets, in such a manner as to restore an order of packets of data generated by performing first interleaving, which is folding interleaving, on first
25 data comprised of plural input packets in units of a data word or plural consecutive data words and performing second interleaving in units of a packet on second data comprised of plural packets generated by said first

interleaving to an order of the packets that constitute said second data;
and

a second de-interleaving step of performing folding de-interleaving, in units of a data word or plural consecutive data words,
5 on fourth data comprised of plural packets generated in said first de-interleaving step, in such a manner as to restore an order of the packets that constitute said second data to an order of the packets that constitute said first data.

10 38. The de-interleaving method according to claim 37,
wherein a value of beginning data in a first packet in packet-unit interleave is replaced according to said second interleaving; and
wherein in said first de-interleaving step, a first packet in said third data is synchronized on the basis of the beginning data whose value
15 is replaced in said second interleaving step.

39. The de-interleaving method according to claim 38, wherein said beginning data is a sink byte in a header of a packet that constitutes said first data.

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40. The de-interleaving method according to claim 38, wherein in said first de-interleaving step, a replaced value of said beginning data is restored to an original value, to generate said fourth data.

25 41. The de-interleaving method according to claim 37, wherein in said first de-interleaving step, whether a packet is lost is known on the basis of information indicating consecutiveness of packets that constitute said third data.

42. The de-interleaving method according to claim 41, wherein
in said first de-interleaving step, when having known that a packet is
lost, data corresponding to the lost packet is replaced with invalid data,
5 to generate said fourth data.

43. The de-interleaving method according to claim 37,
wherein said first de-interleaving step is performed by using
first storage means which is externally attached to a programmable
10 device; and

wherein said second de-interleaving step is performed by using
second storage means which is incorporated in said programmable device.

44. The de-interleaving method according to claim 43, wherein
15 as said first storage means, a random access memory fitted to burst
transfer of data in units of plural data words is used.

45. The de-interleaving method according to claim 44, wherein
as said first storage means, a synchronous dynamic random access memory
20 is used.

46. The de-interleaving method according to claim 43, wherein
as said second storage means, a dual-port random access memory in which
inconsecutive addresses are accessed in units of a data word at each clock
25 synchronized with the data word is used.

47. The de-interleaving method according to claim 37, wherein a predetermined error correction code is added to each of the packets that constitute said first data.

5 48. The de-interleaving method according to claim 47, wherein each of the packets that constitute said first data is obtained by adding said error correction code to plural transport packets, respectively, that constitute a transport stream obtained by performing compression and encoding on the basis of the MPEG-2 standard on predetermined data.

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49. The de-interleaving method according to claim 47, wherein the error correction code is a Reed-Solomon code.

50. The de-interleaving method according to claim 37,
15 wherein said first interleaving is folding de-interleaving which is performed in units of a byte or plural consecutive bytes; and
 wherein said second de-interleaving is folding de-interleaving which is performed in units of a byte or plural consecutive bytes.